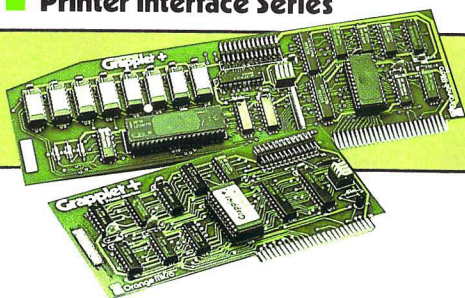


GrappplerTM +

Printer Interface Series

Operators Manual



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INTRODUCTION

The GRAPPLER +™ Interface is a Centronics compatible parallel interface for the Apple® II, II+, and IIe Computer. The GRAPPLER + is also Apple® III compatible when the GRAPPLER + /Apple III Driver is implemented. In addition to advanced text features, it offers high resolution dot graphics (HIRES) dump routines located in firmware. These features are easily invoked by using simple control commands.

Three different versions of the GRAPPLER + are available. The Standard GRAPPLER + offers a wide array of graphics and text features. The second version, the BUFFERED GRAPPLER +, offers all the features of the standard GRAPPLER +, and adds buffering*. The BUFFERED GRAPPLER + is equipped with a 16K RAM buffer, which can be upgraded to 32K or 64K. For special information and instructions regarding the BUFFERED GRAPPLER +, see Appendix B. All other features and instructions for the GRAPPLER + and the BUFFERED GRAPPLER + referred to in this manual are identical.

The third version of the GRAPPLER + is for IDS Printers. The IDS GRAPPLER + is compatible with the IDS 460/560, Microprism 480, and the Prism 80 and 132. The IDS GRAPPLER + has special color graphics capabilities when used with Prism 80 and 132 printers with color graphics options. The BUFFERBOARD and BUFFERED GRAPPLER + do NOT support IDS Printers. See Appendix D for additional commands and information for the IDS GRAPPLER +.

*Buffered Grappler + not designed for Apple III.

“DOCK-ON” BUFFERING AVAILABLE

Should you wish to add buffering to a standard GRAPPLER +, Orange Micro's BUFFERBOARD is an easy way to add up to 64K of memory to your present Apple/GRAPPLER + system. The BUFFERBOARD is a printer buffer that fits into an available slot in your APPLE II+, IIe, or III and “docks” onto your standard GRAPPLER +. For owners of Apples, GRAPPLER +'s and printers, it's the most convenient and economical way available to add buffering capability. Turn to the inside back cover for additional information.

INSTALLATION INSTRUCTIONS

To install the GRAPPLER +, simply plug it into any slot inside the Apple (except 0) as follows:

1. Turn off the power to the Apple. This is important to prevent damage to the computer and the GRAPPLER +.
2. Connect the GRAPPLER + cable to the set of pins on the GRAPPLER +. Make sure that all the pins on the card go into the cable's matching holes. Also, the cable should point away from the card. It will only fit one way.

(Apple is a registered trademark of Apple Computer, Inc.)

3. There is no standardization among printer manufacturers for dot graphics; therefore, the GRAPPLER + has DIP switches located on the interface board itself. The DIP switches on the GRAPPLER + will define what printer you're using. On the DIP switches, there are four positions labeled 1, 2, 3, and 4. Set these DIP switches according to the printer you are using as described in the following chart.

GRAPPLER + DIP SWITCH SETTINGS

DIP SWITCH POSITIONS	1 *	2	3	4
Epson Series	OFF	ON	ON	ON
NEC 8023/C. Itoh 8510/DMP 85	OFF	ON	ON	OFF
Star Gemini	OFF	ON	OFF	ON
Anadex Printers	OFF	ON	OFF	OFF
Okidata 82A, 83A, 92, 93, 84	OFF	OFF	ON	ON
Okidata 84 w/o Step II Graphics	OFF	OFF	OFF	ON
Apple Dot Matrix	OFF	OFF	ON	OFF
IDS Printers	Dip switches can be set to any position when using the IDS version of the GRAPPLER +			

NOTE:

When the + side of the switch is depressed, or set to the right, the switch is in the ON position.

*Switch 1 controls the MSB (Most Significant Bit, or 8th data bit). When this switch is in the ON (+) position the MSB is **NOT** transmitted to the printer. When the switch is in the OFF (-) position, the MSB is under software control (see CTRL-I H and CTRL-I X under TEXT COMMANDS).

4. Remove the cover from the Apple. This is done by pulling up on the cover at the rear edge (the edge farthest from the keyboard) just until the two corner fasteners pop apart. Don't lift the edge any further, instead slide the cover backward until it comes free.
5. Inside the Apple, along the rear edge of the circuit board, is a series of eight long, narrow sockets called "slots." The left-most slot (looking at the computer from the keyboard end) is slot #0. The adjacent slot is slot #1. This is where most Apple programs expect the GRAPPLER + to be located.
6. **Be sure the power is off.** Insert the GRAPPLER + card into slot #1 with a gentle rocking motion until fully seated.
7. Pass the cable through one of the vertical openings in the back of the Apple case.
8. Replace the Apple's cover. Slide the front edge of the cover into place, then press down on the rear corners until they pop into place.
9. Connect the GRAPPLER + cable to the printer.
10. Now turn both your Apple and printer on. Type PR#1 and hit RETURN 5 or 6 times. Your printer should be printing the prompt character for each time you hit the RETURN key. If not, double-check each of the installation procedures and check steps 1 thru 6 under GRAPPLER + Status Check.

GRAPPLER + STATUS CHECK

Before sending a character to the printer, the GRAPPLER + will check the SELECT and PAPER EMPTY status lines. If the printer is not "on-line," or is out of paper, a warning will be printed on the screen and the Apple will beep. If this occurs, check the following:

1. Is the cable firmly and properly attached to the printer?
2. Is the cable firmly seated on the GRAPPLER + card?
3. Is the printer on?
4. Is the printer on-line?
5. Is there paper in the printer?

NOTE:

The GRAPPLER + will not check for paper-out on Epson printers.

6. Is the printer set up for parallel operation?

Check Appendix E for your printer DIP switch setting. Once the error condition has been corrected, you may continue by pressing the RETURN key.

The GRAPPLER + has many text features, including adjustable margins, line length, page length, and others. All commands and their features are listed on the following pages with a description of their function. Each one is preceded by a control character which is CTRL-I from BASIC or CTRL-Y from Pascal or CP/M, unless specifically changed by the user's program.

ENTERING CONTROL CHARACTERS

The Apple's control key (marked CTRL) does not generate a code by itself; it only alters the codes produced by other keys. Throughout this manual you will see references to CTRL characters which control the various functions of the GRAPPLER + (i.e., CTRL-I S, CTRL-I nN). Before you can enter a control (CTRL) character, you must turn on the interface by entering PR#n (n = slot #), then hit RETURN. To enter a CTRL character directly from the keyboard, hold down the CTRL key and depress the I key. Release the I key, then the CTRL key, and type the key or keys corresponding to the GRAPPLER + function you wish to access. Do not enter spaces or punctuation. For example, CTRL-I S would be entered as follows:

1. Turn on the interface by entering PR#1, then hit RETURN.
2. Hold down the CTRL key.
3. Depress the I key.
4. Release the I key, then release the CTRL key.
5. Type the S key, then hit RETURN.

After executing these five steps, the printer will duplicate the present 40 column text screen onto paper. You will also see "SYNTAX ERROR" printed on the paper and the screen. This is because the Apple does not recognize a CTRL command input directly from the keyboard as valid syntax. The GRAPPLER + will still accept and execute the command. If you find this "SYNTAX ERROR" bothersome, enter the command within a program statement. For example, enter

```
10 PR#1:PRINT CHR$(9);"S"
```

and then hit RETURN. Now type RUN and hit RETURN. This will eliminate the "SYNTAX ERROR."

When working in the deferred mode (within a program), there are two ways to enter CTRL characters, depending on whether you're operating in Applesoft or Integer Basic. Both methods use the PRINT statement, as in the following examples:

In Applesoft: 20 PRINT CHR\$(9);"60P"

CHR\$(9) is the function that equates to CTRL-I.

In Integer Basic: 20 PRINT "CTRL-I";"60P"

In Integer Basic, CTRL-I is typed in the manner described on the previous page. When done correctly the line should appear on your monitor as

20 PRINT " "; "60P"

since CTRL characters are not visible on the monitor.

When entering a CTRL character directly from the keyboard, you should not see the character on the Apple screen. If after typing CTRL-I S the S appears on the screen, be sure you have typed PR#n (n = the slot number that your GRAPPLER+ is in) and that you have entered the control command properly.

The GRAPPLER+ does not contain special characters to control printer features. Printer command codes work independently of the GRAPPLER+. For example, if you want to print in the printer's condensed mode, enter the condensed print command as specified in the printer manual after turning the interface on with a PR#n.

TEXT COMMANDS AND FEATURES

Spaces have only been used to make the commands easier to read: **Do not type the spaces** when issuing the commands. Each paragraph is followed by an Applesoft example.

PR#n	Turns on the GRAPPLER+ Interface Card. The n is equal to the slot number of the GRAPPLER+ Interface. All subsequent characters appearing on the Apple video screen will also be printed on the printer. THIS COMMAND MUST BE USED BEFORE ANY OF THE FOLLOWING COMMANDS WILL BE ACCEPTED BY THE GRAPPLER+.
------	--

PR#0	Turns off the GRAPPLER+ Interface Board. All subsequent data will be sent to the Apple screen only. If using a IIe with 80 column card, refer to special commands on page 7.
------	--

CTRL-I A	<p>Append line feeds onto carriage returns. BASIC will not send a linefeed after a carriage return. This means the printhead will return to the left margin but will not advance the paper. The GRAPPLER + will automatically issue a linefeed command and advance the paper after every carriage return. If your printer is performing double line spacing, check your printer DIP switches for auto line feed selection.</p> <p>PRINT CHR\$(9);“A”</p>
CTRL-I K	<p>Don't append linefeeds onto carriage returns. This feature overrides the CTRL-IA command.</p> <p>PRINT CHR\$(9);“K”</p>
CTRL-I B	<p>Turn on bell. This allows a CTRL-G to ring the printer bell. Many printers do not have a bell so check your printer manual to see if this feature is available. The bell feature is disabled as a default, which means that the GRAPPLER + will not pass the ASCII value 7 unless you enable the bell with this command.</p> <p>PRINT CHR\$(9);“B”</p>
CTRL-I C	<p>Turn off bell.</p> <p>PRINT CHR\$(9);“C”</p>
CTRL-I H	<p>Allows the high order (8th) bit to be output to the printer. On many printers this has no effect. On some it allows printing of block graphics, line drawing graphics, or special characters. However, when block graphics are being printed the standard character set is not accessible.</p> <p>NOTE:</p> <p>Dip switch #1 on the GRAPPLER + must be OFF (–) to allow use of this function.</p> <p>PRINT CHR\$(9);“H”</p>
CTRL-I X	<p>Don't output the high order bit to the printer. This puts the printer back into standard text mode and overrides the CTRL-I H command.</p> <p>PRINT CHR\$(9);“X”</p>
CTRL-I nN	<p>Set line length to n characters from left side of page (not from left margin). After issuing this command, characters will only be printed on the printer, not on the Apple screen. A carriage return will automatically be generated after n characters have been printed. If the line length is set to zero, the GRAPPLER + will not issue a carriage</p>

return until it receives one from the Apple. It is recommended that the line length be set to zero when creating dot graphics images independent of the GRAPPLER + graphics functions. This is because the Apple can output as many as a thousand characters per line in the graphics mode. NOTE:

When listing BASIC programs, the printing will automatically be formatted for 40 columns unless this command is used (i.e. CTRL-I 80N).

PRINT CHR\$(9);“80N”

CTRL-I I

Transmits characters to both the Apple screen and the printer. When the line length is set with a CTRL-I nN command the screen will be turned off and printed characters will go only to the printer. If you wish characters to appear on the screen while they are being printed, use this command in conjunction with CTRL-I nN. However, this command will not work when listing a program.

PRINT CHR\$(9);“I”

CTRL-I nL

Set left margin to nth column. All subsequent printing will have n spaces at the start of each line. For example, when using CTRL-I 10L all printing will start in the 10th column position.

PRINT CHR\$(9);“10L”

CTRL-I nR

Set right margin to nth column from left edge of page (not left margin). This command will prevent words from being split at the right margin. The GRAPPLER + will end the line at the first space that occurs after the right margin, but before the end of the line as set by the CTRL-I nN command. A right margin of zero disables this feature.

PRINT CHR\$(9);“75R”

CTRL-I S

Duplicates the present 40 column text screen on the printer. The screen will be printed 20 spaces from the left edge of the paper. The text screen dump commands will only dump the 40 column text screen. This command is not compatible with 80 column text display boards. This command is not available on the Apple III in native mode.

PRINT CHR\$(9);“S”

CTRL-I 2S

Duplicates the text screen memory located in page 1 and page 2 and prints them side by side for an 80 column output. Once again, this command is not compatible with 80

column text display boards.

`PRINT CHR$(9); "2S"`

CTRL-I nP

Set page length to n. The printer will print six linefeeds after n number of lines have been printed. A page length of zero disables the page length feature. Continuous form paper typically has a total of 66 possible lines per page (this may vary with the type of printer). Therefore, if you specify a printed page length of 60 lines (CTRL-I 60P), your printer will print 60 lines and automatically skip over the perforation with 6 line feeds.

`PRINT CHR$(9); "60P"`

CTRL-I CTRL-Y

Change command character to CTRL-Y. To do this, type in CTRL-I CTRL-Y. Any control character may be used here instead of CTRL-Y, but you should avoid characters used by your printer or normal text control characters such as CTRL-M (carriage return).

`PRINT CHR$(9); CHR$(25)`

CTRL-Y CTRL-I

Changes back to command character CTRL-I.

`PRINT CHR$(25); CHR$(9)`

CTRL-IV

Prints out version number of GRAPPLER+ firmware on printer.

The values and conditions listed below are the values which are automatically set any time the GRAPPLER+ is "turned on" with a PR#n command or initialized from Pascal or CP/M:

Left Margin = 0

Right Margin = 0

Line Length = 0

Page Length = 0

Video = On with BASIC

Off with Pascal and CP/M

Line feed after carriage return = Yes with BASIC

No with Pascal and CP/M

Eighth Bit = Off. When GRAPPLER+ DIP switch #1 is in the ON (+) position the 8th bit is not transmitted. When the DIP switch is in the OFF (-) position the 8th bit is under program control (See CTRL-I H).

SPECIAL TEXT FEATURES FOR APPLE IIe

When the Grappler+ is activated with a PR#n, it will determine if it is in a IIe, and if an 80 column card is in use. All text features already described are compatible, but a PR#3 command to turn off the Grappler+ would result in the loss of the screen. The following commands were developed for use with the IIe 80 column card. They do not support the II+.

PR#n

Selects the GRAPPLER+ when the 80 column card (firmware) is in use. This command need not be preceded by an esc CTRL-Q as documented in the IIe manual.

CTRL-Ie	Turns off the GRAPPLER+ while leaving the screen intact and the 80 column card (firmware) active. No PR#3 is required.
CTRL-I8S	Duplicates the present 80 column text screen on the printer. This command supports only the Apple IIe 80 column display.

GRAPHICS COMMANDS AND FEATURES

The GRAPPLER+ Interface can output the HIRES screen to the printer by using simple commands. All graphics commands consist of the command character (usually CTRL-I) followed by a "G," and any options described below. If no other options are used (i.e., CTRL-I G carriage return) HIRES page 1 will be printed horizontally with every white dot on the screen printed as a black dot on the paper. The different options are described as follows:

2—Print HIRES page 2 instead of page 1.

PRINT CHR\$(9);"G2"

S — Print HIRES page 1 and 2 side by side. This feature cannot be used in conjunction with the rotated or double sized options. Some printers do not have enough character positions to allow this feature to be used (i.e. Epson MX-80, Okidata 82A). In these cases print two successive rotated pictures (see CHART RECORDER MODE). Refer to page 10 for sample programs.

PRINT CHR\$(9);"GS"

M — Print the graphics picture and the 4 line text window 20 spaces from the left edge of the paper. The text window may not perfectly align with the picture. This is due to the differences in the Apple graphics and the printer text mode. Rotate, double size, and left margin features do not work with this command. This command is not available on the Apple III in the native mode.

PRINT CHR\$(9);"GM"

D — Print the graphics screen double size. Some printers don't have enough character positions to print a double size image horizontally (e.g. MX-80, FX-80, Okidata 82A & 92). If that is the case, you must also use the "R" option. Otherwise your printer may get confused and "crash," meaning it won't do anything. If that happens you will have to reset the Apple by pressing the reset key, and then reset the printer by turning it off and then on again.

PRINT CHR\$(9);"GD"

E — Prints an "emphasized" image (EPSON Printers, NEC 8023, C.Itoh 8510, DMP 85, and Apple Dot Matrix Printer). When in this mode, the printer will print two closely spaced dots for every one it would normally print. This results in a denser image but printing time is twice as long.

PRINT CHR\$(9);"GE"

I — Invert the image before printing. Normally, every white dot on the screen is printed as the black dot on the paper. This works fine for lines and graphs but if you are printing an actual picture of a person or object it will appear like a negative photograph. Using

this command will print the black portions of the screen as black on the paper allowing the picture to appear normally.

`PRINT CHR$(9);“GI”`

L — Print the image at the left margin previously set using the left margin text command. Depending on the type of printer being used, this margin may be affected by the current print density (characters per inch) or may be automatically set to 7 dot positions per character. If this option is not used, the image will be printed in the center of an 8½ inch page.

`PRINT CHR$(9);“10L”`

`PRINT CHR$(9);“GL”`

R — Rotate the picture 90 degrees in a clockwise direction. Some printers require this option when printing the image double size (See “D” on page 8).

`PRINT CHR$(9);“GR”`

e—Only for the Apple IIe. Prints the picture using the Apple’s Double Hi Resolution Graphics. Requires extended 80-column card and “REV-B” or later IIe. This command cannot be used with either Rotation or Double Sizing.

`PRINT CHR$(9);“Ge”`

***n**—Only for Epson FX/RX printers. “n” is any integer, 1 through 6. Print the picture using any desired FX/RX[†] aspect ratio. See your printer manual for corresponding ratios. These ratios determine the dot density of the printed image.

`PRINT CHR$(9);“G*n”`

[†]RX printers do not support “*5.”

An example of a graphics command would be `CTRL-I GDIR2` followed by a carriage return.

`PRINT CHR$(9);“GDIR2”`

This will print the inverse of HIRES page 2, double size, rotated 90 degrees. Options may be listed in any order, as long as they are preceded by a `CTRL-I G` and followed by a carriage return. Care should be used when using the “L” specifier. If the left margin specified is too large, the picture may wrap around or, depending on the printer, it would cause it to “crash” then both the computer and printer would have to be reset (see “D” on page 8).

NOTE:

When typing GRAPPLER+ commands directly from the keyboard (not from a program), the Apple will give a “SYNTAX ERROR.” This is normal since Applesoft doesn’t recognize this as a valid command. However, the GRAPPLER+ will still recognize the command. To avoid the “SYNTAX ERROR,” type a one line program. For example:

`10 PR#1:PRINT CHR$(9);“GDIR2”:PR#0`

Then hit RETURN. Now type RUN and hit RETURN.

LOADING HIRES PAGES 1 AND 2

In order to use the DUAL HIRES screen dump command available with the GRAPPLER+, you must load a binary (picture) file into HIRES pages 1 and 2 of Apple memory. To load a file directly from the keyboard, use the following commands:

For HIRES page 1 type: `BLOAD filename, A$2000`

For HIRES page 2 type: `BLOAD filename, A$4000`

If you wish to load a file from the deferred (program) mode, use

the DOS commands as follows:

Page 1: PRINT CHR\$(4);"BLOAD filename, A\$2000"

Page 2: PRINT CHR\$(4);"BLOAD filename, A\$4000"

The DOS command must precede the line containing the PR#n which turns on the GRAPPLER + .

The following sample program will load two HIRES pictures, one into page 1 and another into page 2, and dump them using the GRAPPLER + DUAL HIRES feature.

```
10 PRINT CHR$(4);"BLOAD filename 1, A$2000"
```

```
20 PRINT CHR$(4);"BLOAD filename 2, A$4000"
```

```
30 PR#1
```

```
40 PRINT CHR$(9);"GS"
```

```
50 PR#0:END
```

CHART RECORDER MODE

A chart recorder prints a continuous graph on a roll of paper. If you need to chart more information than can be done with a single HIRES or DUAL HIRES screen dump, you can simulate a chart recorder by printing successive screens without any intervening spaces. This feature works in both normal and rotated modes on all printers. The following program loads a graph into HIRES pages 1 and 2 and dumps them continuously without a space separating the two images:

```
10 PRINT CHR$(4);"BLOAD GRAPH1, A$2000"
```

```
20 PRINT CHR$(4);"BLOAD GRAPH2, A$4000"
```

```
30 PR#1
```

```
40 PRINT CHR$(9);"GR"
```

```
50 PRINT CHR$(9);"G2R"
```

```
60 PR#0:END
```

PASCAL AND CP/M COMPATIBILITY

The GRAPPLER + Interface Board is compatible with both Pascal and CP/M. Pascal 1.0 and CP/M will both recognize the card as a serial interface. Entry points have been provided to mimic a serial interface so that the card will function properly with these systems. Pascal 1.1 will correctly interpret that it is a firmware printer interface and access it accordingly. In either case the card will function normally with a few minor exceptions as detailed in the following paragraphs.

Since both systems use CTRL-I to represent a horizontal tab, the default command character has been changed to CTRL-Y. If you are listing a file that contains tabs, be certain the printer tabs have previously been set (see your printer manual).

Both Pascal 1.0 and CP/M use one of the I/O RAM locations to pass the output character. Since the GRAPPLER + was already using all available locations for its variables, the right margin function had to be deleted to make it compatible. This feature is still available from BASIC or Pascal 1.1.

USER ROUTINES FOR ADVANCED PROGRAMMERS:

The following features are included in the GRAPPLER + for the benefit of advanced (assembly language) programmers.

CTRL-I U Jump to the user routine starting at \$300. This

feature is for advanced programmers who wish to bypass the GRAPPLER + firmware. The accumulator will contain the output character. The user routine should "JMP" to \$CF03 when finished, which will restore the stack and registers.

CTRL-I U Jump to the user routine starting at \$D000, bank A of a RAM card in slot 0. The GRAPPLER + will enable the RAM card prior to the jump. As with CTRL-I U, the accumulator will contain the output character. The user routine should "JMP" to \$CF00 to disable the RAM card and restore the stack and registers when finished.

NOTE: To restore the normal GRAPPLER + firmware, you must execute a PR#0 followed by a PR#n (n = slot #).

CUSTOM DRIVERS

If you are writing your own drivers, the following locations are used to access the card (Y = NO where N = slot#):

ADDRESS	READ	WRITE
\$C080, Y	Status	Output
\$C081, Y	Status	Select bank 2 of ROM
\$C082, Y	Status	Reset Interrupt Request and IRQ data bit
\$C084, Y	Status	Output/Interrupt on ACK

NOTE:

A READ in the range of \$CN00 to \$CNFF (N = slot #) will select bank 1 of ROM. When an Interrupt (IRQ) has been generated by the GRAPPLER +, bit 7 (MSB) of the status byte will be set to 1 (High).

The following routine gives an example of how to output a character using these locations:

```

        PHA                ; SAVE OUTPUT CHARACTER
                           ; ON STACK
        LDY 10             ; SET UP Y-REGISTER FOR SLOT
                           ; #1
PAPER?  LDA $C080, Y       ; CHECK STATUS FOR PAPER
        AND 04             ; CHECK BIT 2
        BNE PAPER?        ; IF SET THEN NO PAPER,
                           ; RECHECK
SLCT?   LDA $C080, Y       ; CHECK STATUS FOR PRINTER
                           ; SELECT
        AND 02             ; CHECK BIT 1
        BEQ SLCT?         ; IF ZERO THEN NOT SELECTED
ACK?    LDA $C080, Y       ; CHECK STATUS FOR PRINTER
                           ; BUSY
        AND 01             ; CHECK BIT 0
        BEQ PAPER?        ; IF SET THEN PRINTER IS
                           ; BUSY
OUTPUT? PLA                ; RESET OUTPUT CHARACTER
        STA $C080, Y       ; STORE TO OUTPUT LATCH
        RTS                ; RETURN FROM SUBROUTINE

```

GRAPPLER + STATUS BITS

B7	INTERRUPT
B6	PRINTER TYPE
B5	PRINTER TYPE
B4	PRINTER TYPE
B3	BUSY
B2	PAPER EMPTY
B1	SELECT
B0	ACKNOWLEDGE

MEMORY LOCATIONS USED BY THE GRAPPLER +

The GRAPPLER + uses those RAM locations set aside for its particular slot and the slot scratchpad area common to all slots. The ROM is turned on using the standard ROM expansion protocol and resides in the locations \$C800 to \$CFFF. The entry points and the various RAM variables are listed below (N = Slot number):

Cold Entry	= \$CN00
Warm Entry	= \$CN02
Left Margin	= \$478 + \$0N
Right Margin	= \$678 + \$0N
Line Length	= \$578 + \$0N
Page Length	= \$5F8 + \$0N
Character Counter	= \$4F8 + \$0N
Line Counter	= \$6F8 + \$0N
Current Cmd. Char.	= \$778 + \$0N
Text Flags	= \$7F8 + \$0N

Text Flag Bit Representations:

- (Bit 7 — Output high order bit)
- (Bit 6 — Video turned on)
- (Bit 5 — LF after a CR)
- (Bit 4 — Bell On)
- (Bit 0-3 — Reserved)

APPENDIX A

USING GRAPPLER + COMMANDS WITHIN A PROGRAM

The following table illustrates how a few GRAPPLER + commands would be used within a program:

INTEGER BASIC	APPLESOFT	DESCRIPTION
10 PRINT "CTRL-D";"PR#1"	10 PRINT CHR\$(4);"PR#1"	Turns on GRAPPLER + Interface. If you are not using DOS (disc operating system) then enter the line as: 10 PR#1
20 PRINT "CTRL-I";"80N"	20 PRINT CHR\$(9);"80N"	Set line length to 80 columns and turn off Apple video.
30 PRINT "TESTING"	30 PRINT "TESTING"	Prints "Testing" on the printer.
40 PRINT TAB(50); "TESTING"	40 PRINT TAB(50); "TESTING"	Tabs to the 51st column and prints "Testing."
50 PRINT "CTRL-I";"CTRL-A"	50 PRINT CHR\$(9);CHR\$(1)	Changes the CTRL-I command character to CTRL-A
60 PRINT "CTRL-A";"10L"	60 PRINT CHR\$(1);"10L"	Sets left margin to 10. Notice use of new command character, CTRL-A
70 PRINT "GRAPPLER + INTERFACE"	70 PRINT "GRAPPLER + INTERFACE"	Prints "GRAPPLER + Interface." Notice printing starts at 10th column.
80 PRINT "CTRL-D";"PR#0"	80 PRINT CHR\$(4);"PR#0"	Turns off the GRAPPLER +. If you are not using DOS enter the line as: 80 PR#0

NOTES:

Whenever you see CTRL-I enter the command, control I, as explained in the section "Text Features." For example, since control characters don't appear on the screen, line 10 will look like this: 10 PRINT " "; "PR#1".

The following programs allow you to test the graphics capability of the GRAPPLER +.

For Applesoft Basic Users:

```
5 TEXT
10 HOME
20 PRINT "ENTER THE SLOT YOUR GRAPPLER + IS IN
AND"
30 INPUT "HIT THE RETURN KEY: ";S
50 HGR:REM CLEAR HIRES PAGE 1
60 HCOLOR = 3:REM SET COLOR TO WHITE
70 POKE 49234,0:REM SWITCH TO FULL-SCREEN GRAPHICS
80 HPLOT 0,0 TO 279,0 TO 279,190 TO 0,190 TO 0,0:REM DRAWS
RECTANGLE
90 FOR X = 0 TO 279 STEP 9: HPLOT X,0 TO X,190:REM PLOT
VERTICAL LINES
100 NEXT X
110 FOR Y = 0 TO 190 STEP 5:HPLOT 279,Y TO 0,Y:REM PLOT
HORIZONTAL LINES
120 NEXT Y
130 PRINT CHR$(4);"PR#";S:REM TURNS ON GRAPPLER +
140 PRINT CHR$(9);"G":REM DUMP HIRES PAGE 1 NORMAL
150 PRINT CHR$(4);"PR#0":REM TURNS OFF GRAPPLER +
160 TEXT:REM HOME CURSOR
999 END
```

NOTE:

REM statements have only been added to the programs for clarification for the user and don't need to be typed in when executing the program.

For Integer Basic Users:

Line 6 should be typed 6 D\$ = "CTRL-D" (The CTRL-D won't show on the screen).

Line 7 should be typed 7 I\$ = "CTRL-I"

```
5 B=1
6 D$=" ":REM CTRL-D
7 I$=" ":REM CTRL-I
10 CALL-936:REM CLEAR SCREEN AND HOME
20 PRINT "ENTER THE SLOT YOUR GRAPPLER + IS IN"
30 PRINT "AND HIT THE RETURN KEY:"
40 INPUT S
50 POKE 8192,0:POKE 8193,0:POKE 66,1:POKE 67,32:POKE
60,0:POKE 61,32:POKE 62,255:POKE 63,63:CALL-468
55 POKE-16297,0:POKE-16300,0:POKE-16302,0:POKE-16304,0
60 FOR A = 8192 TO 9207
70 POKE A,255:FOR C = (A + 1024) TO (A + 7168) STEP 1024:POKE
C,B:NEXT C
80 NEXT A
130 PRINT D$;"PR#";S:REM TURNS ON GRAPPLER +
140 PRINT I$;"G":REM DUMP HIRES PAGE 1 NORMAL
150 PRINT D$;"PR#0":REM TURNS OFF GRAPPLER +
160 TEXT:CALL-936:REM HOME CURSOR
999 END
```

NOTES ON BOTH PREVIOUS PROGRAMS:

If you are not using DOS (Disk Operating System), type line 130 as follows:
130 PR#S and line 150 as 150 PR#0.

To experiment with the different options, try changing line 140. You don't have to retype the whole program; just type a new line 140. For example:

Applesoft:

```
140 PRINT CHR$(9);"GI" or 140 PRINT CHR$(9);"GDR"
```

Integer:

```
140 PRINT I$;"GI" or 140 PRINT I$;"GDR"
```

The following two examples are for Pascal Users only.

Example #1:

```
FOR PASCAL USERS:
PROGRAM DEMO;
USES TURTLEGRAPHICS, APPLESTUFF;

VAR ANGLE,DISTANCE:INTEGER;
    PRINT:TEXT;

BEGIN
    ANGLE:=80;
    INITTURTLE;
    PENCOLOR(WHITE);
    FOR DISTANCE:=1 TO 99 DO
        BEGIN
            MOVE (2*DISTANCE);
            TURN(ANGLE);

            END;
        REWRITE(PRINT, 'PRINTER:');
        WRITELN(PRINT,CHR(25), 'G');
        (*USE CHR(25)(CTRL-Y) IN PASCAL*);
    END.
```

Example #2

```
PROGRAM Load_Pic;
{This program demonstrates how to load a picture which has been
saved to disk using a BLOCKWRITE command.}
USES TURTLEGRAPHICS, APPLESTUFF;
CONST Hires_Page_1 = 8192;
VAR Disk_Block: RECORD CASE BOOLEAN OF
    TRUE: (Intpart: INTEGER);
    FALSE: (Ptrpart: ^INTEGER);
END;
    ch: CHAR;
    fname: STRING;
    prnt: TEXT;
PROCEDURE Bload (Filename: STRING);
    VAR io: INTEGER;
        f: FILE;
BEGIN
    Disk_Block.Intpart := Hires_Page_1;
    RESET (f,Filename);
    io:= BLOCKREAD (f,Disk_Block.Ptrpart^,16);
    CLOSE (f, LOCK);
END;
PROCEDURE Print_ Picture;
VAR options: STRING;
BEGIN
    WRITE ('Enter options: ');
    READLN (options);
    REWRITE (prnt, 'PRINTER:');
    WRITELN (prnt, CHR(25), 'G', options);
    CLOSE (prnt);
END;
BEGIN
    INITTURTLE;
REPEAT
TEXTMODE;
WRITELN ('Enter picture name (specify drive):');
```

(An example of an entry would be:
 #5:Picture.Foto
 Where Picture.Foto is a picture on drive 2.)
 READLN (fname);
 GRAFMODE;
 Bload (fname);
 REPEAT UNTIL KEYPRESS; {wait until key is pressed}
 READ (KEYBOARD,ch); {clear keyboard}
 TEXTMODE;
 Print_Picture;
 WRITE ('Print more pictures?');
 READLN (ch);
 UNTIL (ch = 'N') or (ch = 'n');
 END.

FOR APPLESOFT BASIC USERS

The following program will allow you to print a graph that has been previously saved to the disk. For example, after saving the graph created by one of the popular graphing programs for the Apple, run this program to print the graph on your printer.

NOTE:

If your GRAPPLER + is not in slot #1 change line 5 so that S equals the slot number of your GRAPPLER + .

```

5 S=1
10 HOME
20 D$=CHR$(4):REM CTRL-D FOR APPLE DOS
30 I$=CHR$(9):REM CTRL-I
40 PRINT "ENTER THE NAME OF THE GRAPH:"
50 INPUT N$
60 HGR:REM CLEAR HIRES PAGE 1
70 PRINT D$;"BLOAD";N$;"",A$2000":REM LOAD PICTURE INTO HIRES PAGE 1
80 VTAB 22
90 PRINT "ENTER OPTIONS (D,I,R,L,E,NORMAL);"
100 INPUT A$
105 IF LEFT$(A$,1)="N" THEN A$="":REM IF NORMAL THEN NO OPTIONS
110 PRINT D$;"PR#";S:REM TURNS ON GRAPPLER +
120 PRINT I$;"G";A$:REM DUMP HIRES PAGE 1 WITH OPTIONS
130 PRINT D$;"PR#0":REM TURNS OFF GRAPPLER +
140 TEXT:HOME
999 END

```

For Integer Basic Users:

In the following program, line 30 should be typed with a CTRL-D between the quotes. Line 40 should be typed with a CTRL-I between the quotes.

```
5 S=1
10 CALL-936:REM HOME CURSOR
20 DIM N$(30):DIM A$(10)
30 D$=" ":REM CTRL-D FOR APPLE DOS
40 I$=" ":REM CTRL-I
50 PRINT "ENTER THE NAME OF THE GRAPH:"
60 INPUT N$
70 PRINT D$;"BLOAD";N$;"",A$2000":REM LOAD PIC-
  TURE INTO HIRES PAGE 1
80 PRINT "ENTER OPTIONS (D,I,R,E,L,NORMAL):"
90 INPUT A$
95 IF LEFT$(A$)="N" THEN A$=" ":REM IF NORMAL
  THEN NO OPTIONS
100 PRINT D$;"PR#";S:REM TURNS ON GRAPPLER +
110 PRINT I$;"G";A$:REM DUMP HIRES PAGE 1 WITH
  OPTIONS
120 PRINT D$;"PR#0":REM TURNS OFF GRAPPLER +
130 TEXT:CALL-936:REM HOME CURSOR
999 END
```

FOR TERRAPIN & KRELL LOGO USERS:

```
TO HC ;HARDCOPY OF GRAPHICS SCREEN
OUTDEV 1
(PRINT1 CHAR 9 "G CHAR 13)
OUTDEV 0
END
```

FOR APPLE LOGO USERS:

```
TO HC ;HARDCOPY OF GRAPHICS SCREEN
.PRINTER 1
(TYPE CHAR 9 "G CHAR 13)
.PRINTER 0
END
```

The GRAPPLER+ graphics commands (rotate, inverse, etc.) can be incorporated within the LOGO screen dump by placing the proper command immediately after the "G in the third program line of the LOGO program listing. Refer to GRAPHICS FEATURE AND COMMANDS for detailed descriptions of each command.

APPENDIX B

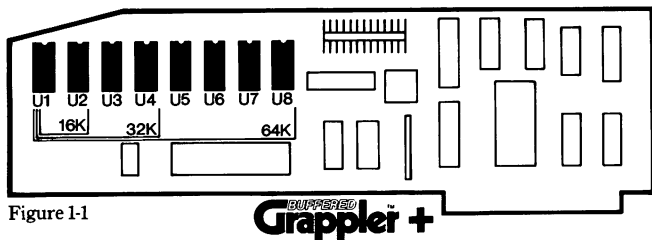


Figure 1-1

INSTRUCTIONS FOR BUFFERED VERSION

THEORY OF OPERATION

Without a buffer, the Apple Computer can only output data as fast as your printer can print. Most printers operate at only 80-150 characters per second. The Apple is capable of outputting up to 3000 characters per second, but is limited to 1/30 of its output rate due to the printer's slower speed. This ties up the entire system while the Apple waits for the printer to finish its job.

With the buffer acting as a storage tank between the Apple and the printer, the Apple is free to output data at a maximum speed without waiting for the printer to catch up. Therefore, while the printer is printing, the Apple can be busily searching disks, computing data, or allowing you to input more data. This allows your system to operate at its maximum speed and efficiency.

RAM DIAGNOSTIC SELF TEST

The BUFFERED GRAPPLER+ is equipped with its own built-in RAM Diagnostic Self Test. This unique feature informs the user of any abnormal condition related to the RAM memory chips. To perform the Self Test, follow these procedures.

1. Perform installation steps 1 through 9 (refer to Installation Procedure on Page 1).
2. Turn your printer on with paper installed and place it on line.
3. With Apple power off, hold the RESET key down.
4. While holding the RESET key down, turn on your Apple.
5. Keep the RESET key depressed for two or three seconds, then release the RESET key. (NOTE: If keyboard encoder is set for CTRL-RESET, you will find this function a bit more difficult to execute with just two hands.)

Your printer will then print "RAM TEST IN PROGRESS:" to indicate that the diagnostic check is being performed, and your disk drive will "boot" if connected. After approximately 45 seconds, the test results will be printed on the printer.

The output on the printer will indicate the condition of each RAM chip as in the following example:

RAM STATUS-CHIP#	8	7	6	5	4	3	2	1
	X	X	X	X	1	1	1	1

A "1" below the chip number indicates that a RAM chip is installed and is in good condition. An "X" below the chip number indicates the absence of a RAM chip or improper condition of the corresponding chip. In the example above chips 1-4 are in good

condition and chip sockets 5-8 are empty. This would be the configuration for a 32K RAM buffer. A Self Test on a BUFFERED GRAPPLER + configured for a 16K RAM would be printed out as follows:

RAM TEST IN PROGRESS:

RAM STATUS CHIP#	8	7	6	5	4	3	2	1
	X	X	X	X	X	X	1	1

The above printout indicated that chips 1 and 2 are installed and in good condition, and chips 3 through 8 are absent.

The RAM Diagnostic Self Test will also be automatically performed if an abnormal condition occurs during power up. The test will repeat itself until the malfunction has been corrected by the user.

RESETTING THE BUFFER

Resetting the BUFFERED GRAPPLER + RAM buffer is accomplished by depressing the RESET (for the IIe use CTRL-RESET) for two seconds. This clears all data from the buffer RAM. If the printer does not have an internal buffer, printing will stop as soon as the BUFFERED GRAPPLER + is reset. If the printer does have an internal buffer, printing will continue until the printer's internal buffer is emptied.

Depressing the RESET key for less than two seconds will simply RESET the Apple. Printing will continue until the BUFFERED GRAPPLER + and printer buffers have been emptied.

INSTALLATION OF RAM EXPANSION CHIPS

The BUFFERED GRAPPLER + includes a standard 16K RAM buffer. Additional RAM Expansion Packages may be purchased from your local computer dealer. Each RAM Expansion Package contains two 4264 dynamic RAM chips.

To expand your BUFFERED GRAPPLER + to 32K, one RAM Expansion Package must be added to sockets U3 and U4 (see Figure 1-1). To expand to 64K all sockets must contain RAM expansion chips. Four chips are necessary to expand from 32K to 64K; therefore, two RAM Expansion Packages must be added. Three RAM Expansion Packages would be needed to convert from 16K to 64K. There is no provision on the BUFFERED GRAPPLER + for 48K.

When installing RAM chips, it is necessary to align pin 1 on the chip with pin 1 on the BUFFERED GRAPPLER + socket. Each socket has pin 1 labeled "1" on the BUFFERED GRAPPLER + to identify the proper orientation of the chip.

Each RAM chip has either a notch at one end of the chip or a dimple in a corner of the chip. This notch identifies the end of the chip containing pin 1. The chip must be placed in the socket so that the notch or dimple is adjacent to pin 1 of the BUFFERED GRAPPLER + socket. The chip socket will also have a notch near pin 1 to help you locate pin 1.

To install a RAM chip, position the chip pins into their corresponding socket holes and gently plug the chip into the socket. Look at all the pins to verify proper seating of the chip and that no pins have been bent or broken during installation.

APPENDIX D

IDS PRINTER USER'S SECTION

The GRAPPLER + DIP switch settings listed on page 2 refer only to non-IDS GRAPPLER + boards, and have no effect on IDS printers. Therefore, the section on GRAPPLER + DIP switches can be ignored when configuring an IDS GRAPPLER +. However, printer DIP switches will have to be set according to the instructions below.

The special IDS color screen dump command (CTRL-I GC) has been programmed to work best with the IDS PRISM Color Process ribbon. The Primary ribbon can be used, but the GRAPPLER + will adjust the ribbon according to the Color Process ribbon format, and colors may not transfer to hardcopy as expected. Note also that all areas appearing as white on your monitor will be printed as black on the printer. Therefore, you may wish to use the GRAPPLER + Inverse Color Screen Dump command (CTRL-I GCI) for hardcopy resembling the monitor representation. This inverse command does not affect the color portions of the screen, so your printout will match the screen color in either inverse or normal modes. The Color Screen Dump feature does not support the IDS Microprism 480.

The BUFFERBOARD and BUFFERED GRAPPLER + do not support IDS printers.

IDS PRINTER DIP SWITCH SETTINGS

The IDS Grappler + is designed for use with IDS Prisms, Microprism and 460/560 printers.

IDS 460G AND 560G:

S-4 switch 5 is off and switch 7 on

S-3 switches 6 and 7 off

Strapping set as follows (located beside IDS cable connector):

8-7 installed for parallel operation

11-4 installed for busy active when high

12-3 installed for strobe active when low

IDS PRISM 80 AND 132:

S-4 switch 5 is off and switch 7 on

S-3 switches 6 and 7 off

Strapping set as follows (located beside IDS cable connector):

3-4 installed for parallel operation

9-10 installed for busy active when high

11-12 installed for strobe active when low

IDS MICROPRISM 480:

Switches 1, 2, 4 and 5 must be off

Strapping set as follows* (located behind IDS cable connectors):

1-2 installed

7-8 installed

*These are the positions as set from the factory.

APPENDIX E

DIP SWITCH SETTINGS FOR YOUR PRINTER *

All printers must configure to a Centronics type parallel interface.

ANADEx 9000, 9001, 9000A, 9001A, 9500, 9501, 9500A, 9501A

All switches on S-3 must be off. Set switches on S-1 and S-2 appropriately.

ANADEx 9620

All switches on S-3 must be off. Set switches on S-15 and S-14 appropriately.

EPSON MX-80; MX-80FT With Grafrax-80 or Grafrax +

All switches on S-2 should be off. DIP switch S-1, switch 8 must be on and switch 3 must be off.

EPSON MX-100 and MX-100 with Grafrax +

S-2 switch 3 must be off

S-1 switch 6 must be off and switch 8 must be on.

EPSON FX SERIES

Factory Settings are Compatible

NEC 8023, DMP 85, and APPLE DMP

SW-1: 6 closed, 7 closed, 8 open.

SW-2: 2 open, 5 open, 6 closed, 7 closed.

C.ITOH 8510A

SW-1: 6 closed, 7 closed, 8 open.

SW-2: 2 open, 5 open, 6 closed, 7 closed.

SW-3: No changes required.

SW-4: Switch 4 must be open for parallel interface.

OKIDATA 82A OR 83A with Graphic Upgrade and Okidata 92 & 93

SW-1: Switches 1,2,3,4,8 off. Switches 5,6,7 on.

SW-2: No changes required.

OKIDATA 84

Switch-1 on. All other switches off.

STAR MICRONICS GEMINI 10 & 15

1 Off, 2 Off, 3 On, 4 Off

Note:

*All switches not mentioned may be set as user desires.

GRAPPLER + TM POWER CONSUMPTION

	STANDBY MODE	ACTIVE
Typical	88mA	158mA
Maximum	162mA	283mA

BUFFERED GRAPPLER + POWER CONSUMPTION

	STANDBY MODE	ACTIVE
Typical	170mA	240mA
Maximum	317mA	438mA

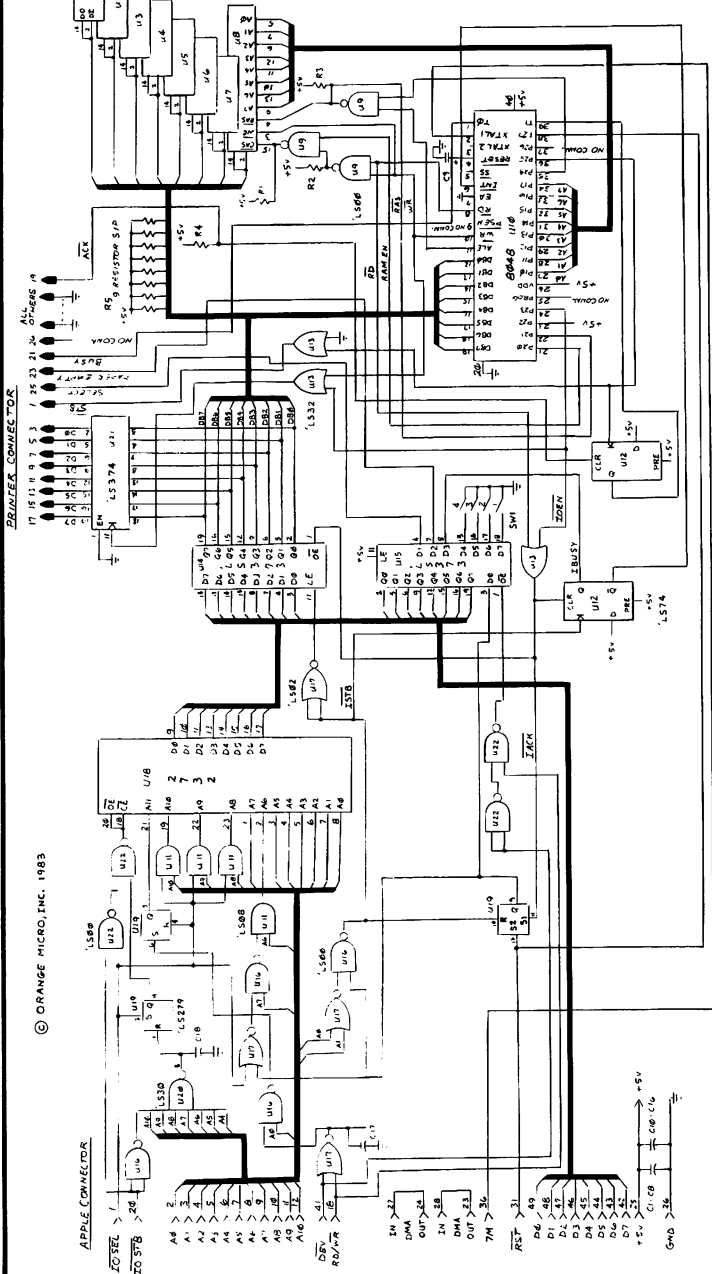
Add 20mA for each additional RAM chip.

GRAPPLER + TM PIN ASSIGNMENTS

Function	Standard or BUFFERED GRAPPLER + Interface	IDS GRAPPLER + Interface
STB	1	5
D0	3	2
D1	5	25
D2	7	23
D3	9	21
D4	11	19
D5	13	17
D6	15	4
D7	17	—
ACK	19	18
BUSY	21	12
P.E.	23	22,26
SLCT	25	7
N/C	—	10,20
GND	all others	all others



BUFFERED Grappler™ +



LIMITED WARRANTY

Every GRAPPLER + and BUFFERED GRAPPLER + INTERFACE is fully tested and quality checked before shipment and is warranted to be free from defects in materials and workmanship for a period of 90 days from date of purchase. During that time period, Orange Micro will at no charge repair or replace any defective unit returned to its Service Department in accordance with the instructions below.

Orange Micro disclaims any liability to users of the GRAPPLER + and BUFFERED GRAPPLER + for consequential damages of any kind arising from or connected with the use of the GRAPPLER + and BUFFERED GRAPPLER + Interface.

This warranty is void in cases of misuse, abuse, abnormal conditions of operation or attempts to alter or modify the function of a part or assembly.

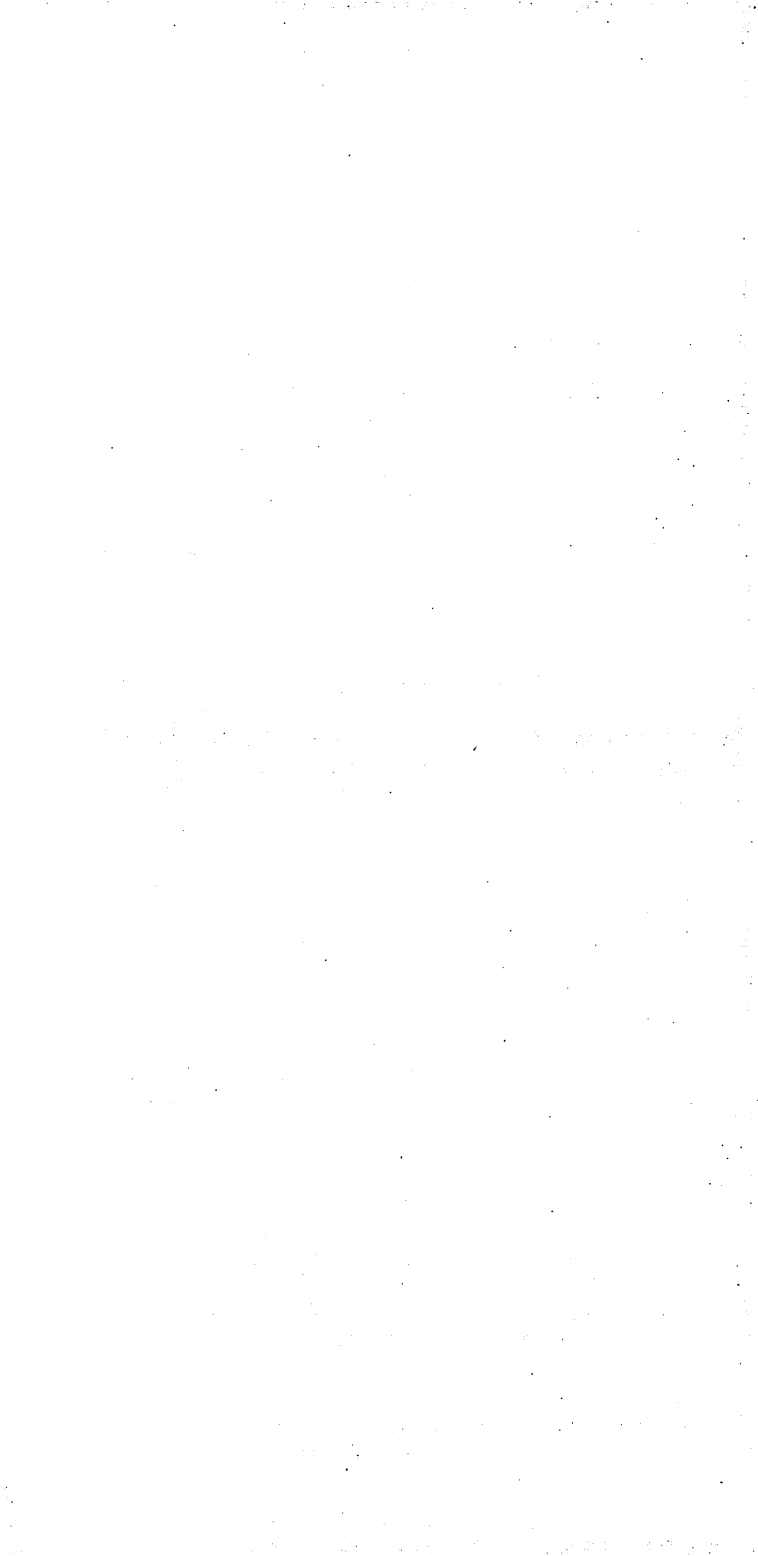
This limited warranty is in lieu of all other warranties expressed or implied, and no representative or other person is authorized to represent or assume for Orange Micro any warranty liability beyond that set forth herein.

This warranty gives you specific legal rights, and you may also have additional rights which vary from state to state.

If problems do occur with a GRAPPLER + or BUFFERED GRAPPLER + INTERFACE, please notify Orange Micro of the model, serial number, date of purchase, and particular details. Do not return the unit to Orange Micro until you have received authorization to do so.

When returning equipment, ship in the original carton or securely packed in a cardboard carton with at least two inches of cushioned packing material on all sides. Mark the package "FRAGILE" and ship via UPS, Parcel Post, or Air Freight, insured and prepaid. **COLLECT SHIPMENTS WILL BE REFUSED AND RETURNED. Enclose a clear description of the problems experienced, sample printouts if possible, proof of purchase date, return address, and preferred shipping method.**

The Warranty expressed above applies only to GRAPPLER + and BUFFERED GRAPPLER + INTERFACES sold and used in the United States of America.

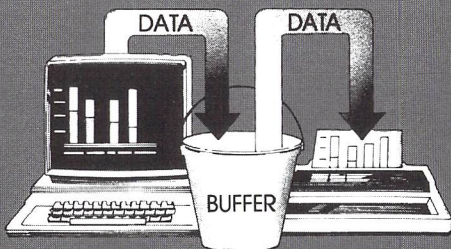


The Bufferboard™

For Apples and Printers

The Bufferboard is a unique printer buffer designed for the Apple II, II + , IIe, and III computers. It has the capacity to store up to 20 full pages of text at a time. The Apple transmits a "bucketful" of data which is stored in the Bufferboard and then fed to the printer at its own printing rate. Your computer is set free from monitoring the printer and becomes immediately available to resume user operations.

- Versions for Grappler/Grappler + interface, Epson interface, Apple interface, and other popular printer interfaces
- 16K buffer standard
- Expandable to 32K or 64K
- Fits into any available Apple slot



See your local computer store for more information

*Also Orange Interface Compatible.



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